

ECG as diagnostic tool for pulmonary embolism: A case report

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Abstract:

Acute pulmonary thromboembolism (PTE) is a challenge to recognize and diagnose due to its varied presentation. The radiological imaging for diagnosis of PTE may be difficult to perform in certain critical or hemodynamically unstable cases. The electrocardiogram (ECG) changes may not be specific in PTE but together with clinical features and history, can form the basis of suspicion leading to early diagnosis of this life threatening disease. The authors present a case of acute PTE in a patient with carcinoma cervix who presented with the ECG changes leading to her early diagnosis, thus saving her life.

Keywords: Acute pulmonary embolism; Electrocardiogram; Tachycardia; Thromboembolism.

Introduction:

Acute pulmonary thromboembolism (PTE) is a life threatening disease requiring immediate and prompt diagnosis on suspicion, as the delay can result in poor outcome, including fatality [1-3]. It is caused as a result of embolic occlusion of the pulmonary arteries, the most common reason being the deep vein thrombosis (DVT) of the lower limb [3]. The electrocardiogram (ECG) is a quick, easy to use, cost effective, and efficient tool in the hands of a clinician. The ECG pattern of S1Q3T3 is suggestive of acute cor-pulmonale or the right heart strain [4]. The presence of this pattern associated with ECG along with clinical findings is highly suspicious of PTE [1]. The authors present a case of acute PTE which was diagnosed early with the help of ECG.

Case Report:

A 51 years old Indian female, with no previous known medical co-morbidities and newly diagnosed cervical carcinoma (one month prior), based on the history on irregular abnormal bleeding per vagina, CT pelvis showing cervical mass and high levels of serum CA-125 (not started on any treatment yet) presented to the emergency with an acute onset of right sided pleuritic chest pain. She was admitted in the ward for further evaluation. After admission, she developed sudden respiratory distress with severe hypoxia and thus was shifted to respiratory intensive care. On examination she was conscious, oriented with no focal neurological deficit, dyspnic, tachypnic, blood pressure 130/70mmHg, heart rate 126/min sinus, oxygen saturation 90% on oxygen@15litres/minute through non-rebreathing face mask, respiratory rate 30/min, chest on auscultation: bilateral air entry present, heart sounds: normal, abdomen: soft, non-tender, no pallor/icterus/cyanosis, bilateral feet pitting edema present. She was noticed to have tenderness and swelling over the right lower limb in the calf region.

Her ECG was immediately done which showed the sinus tachycardia with the S wave in lead I with Q wave and inverted T wave in lead III, giving a probable diagnosis of acute pulmonary embolism or cor-pulmonale (Figure 1). Her echocardiogram showed normal left ventricular ejection fraction, no regional wall motion abnormality with mild dilatation of right atrium and ventricle. An empirical diagnosis of pulmonary embolism was made and the patient underwent a CT pulmonary angiogram with DVT protocol which revealed bilateral main pulmonary artery thrombosis with extension into the lobar and segmental arteries, with evidence of DVT in right lower limb. Her blood pressure remained stable with gradually decreasing oxygen requirement and had a recent history of bleeding per vagina, so the attempt for thrombolysis was ruled out (as the risk of bleeding outweighed the benefit). She was started on unfractionated heparin infusion to target the aPTT 2-2.5 times the control. Gradually she showed improvement in her oxygenation and her heparin infusion was discontinued after about three days of initiation and she was started on LMWH (enoxaparin 1mg/kg/dose twice daily). Patient was later transferred to room in a stable condition on room air for further management of her cervical carcinoma. A written and informed consent was taken from the patient for using the clinical images and the details of the case.

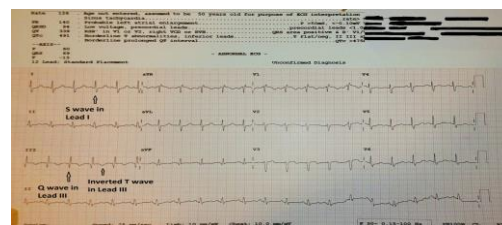


Fig. 1: ECG showing sinus tachycardia (heart rate 124/minute with McGinn-White S1Q3T3 sign in a case of acute pulmonary embolism

Discussion:

ECG changes, although having a low sensitivity and specificity, can prompt the clinician to suspect PTE and this can lead to an early diagnosis [1]. The various radiological studies for diagnosis of PTE (CT pulmonary angiography, V/Q scan, and echocardiogram) sometimes divert the clinicians to use ECG as a diagnostic tool. Various studies have been published showing the ECG findings in a case of acute PTE [1]. The ECG changes in a case of PTE include: sinus tachycardia, new right bundle branch block (complete or incomplete), right axis deviation of the QRS complex, atrial fibrillation/flutter, ST-segment elevation in precordial leads (V1 and aVR), low voltage or amplitude of QRS complexes in limb leads, atrial premature contractions, and T wave inversions in leads V1-V4 [1,4-7]. The classical ECG pattern of S1Q3T3 was first described in 1935 by McGinn and White (thus the pattern is also known as McGinn-White sign on ECG), and is present only in 15-20% of the cases [7]. The classic McGinn-White sign when present in case of PTE, signifies severity and higher mortality associated with it [1,5,8]. This sign or the S1Q3T3 pattern may also be found in cases of acute bronchospasm, pneumothorax, and other acute lung disorders [7].

The ECG changes as described above, with clinical features suggestive of PTE can lead to an early diagnosis. The clinical features include: pleuritic chest pain and dyspnea of acute onset, and in severe cases shock or syncope. The common predisposing factors for development of PTE are: old age, previous history of PTE or DVT, active cancer, immobilization due to spinal cord injury or surgery or trauma or critical illness, pregnancy or females on oral contraceptives or hormonal replacement therapy.

Conclusions:

Acute pulmonary embolism is a disease with high fatality, if not diagnosed and treated early. ECG changes along with clinical features in a patient with high risk of PTE rules out the life threatening conditions like acute myocardial infarction and aid the clinicians in early suspicion and diagnosis of PTE.

Conflicts of interest: None declared

Acknowledgements: None

References:

1. Yu H-H, Jeng J-R. Pulseless electrical activity in acute massive pulmonary embolism during thrombolytic therapy. *Ci Ji Yi Xue Za Zhi*. 2017;29(1):50-4.
2. Shahani L. S1Q3T3 pattern leading to early diagnosis of pulmonary embolism. *BMJ Case Rep*. 2012;2012:bcr2012006569.
3. Ryan J. Pulmonary embolism: new treatments for an old problem. *Open Access Emerg Med*. 2016;8:87-95.
4. Ali OM, Masood AM, Siddiqui F. Bedside cardiac testing in acute cor pulmonale. *BMJ Case Rep*. 2014;2014:bcr2013200940.
5. Nampoothiri RV, Lakshman A, Bhalla A, Varma S. ECG In Evaluation for Pulmonary Thromboembolism-Occam's Razor or Hickam's Dictum? *J Clin Diagn Res*. 2016;10(5):OJ01.
6. Konstantinides SV, Torbicki A, Agnelli G, Danchin N, Fitzmaurice D, Galiè N, et al. 2014 ESC guidelines on the diagnosis and management of acute pulmonary embolism. *Eur Heart J*. 2014;35(43):3033-069.
7. Levis JT. ECG Diagnosis: Pulmonary Embolism. *Perm J*. 2011;15(4):75.
8. Kukla P, Długopolski R, Krupa E, Furtak R, Wrabec K, Szelemej R, et al. The value of ECG parameters in estimating myocardial injury and establishing prognosis in patients with acute pulmonary embolism. *Kardiol Pol*. 2011;69(9):933-38.